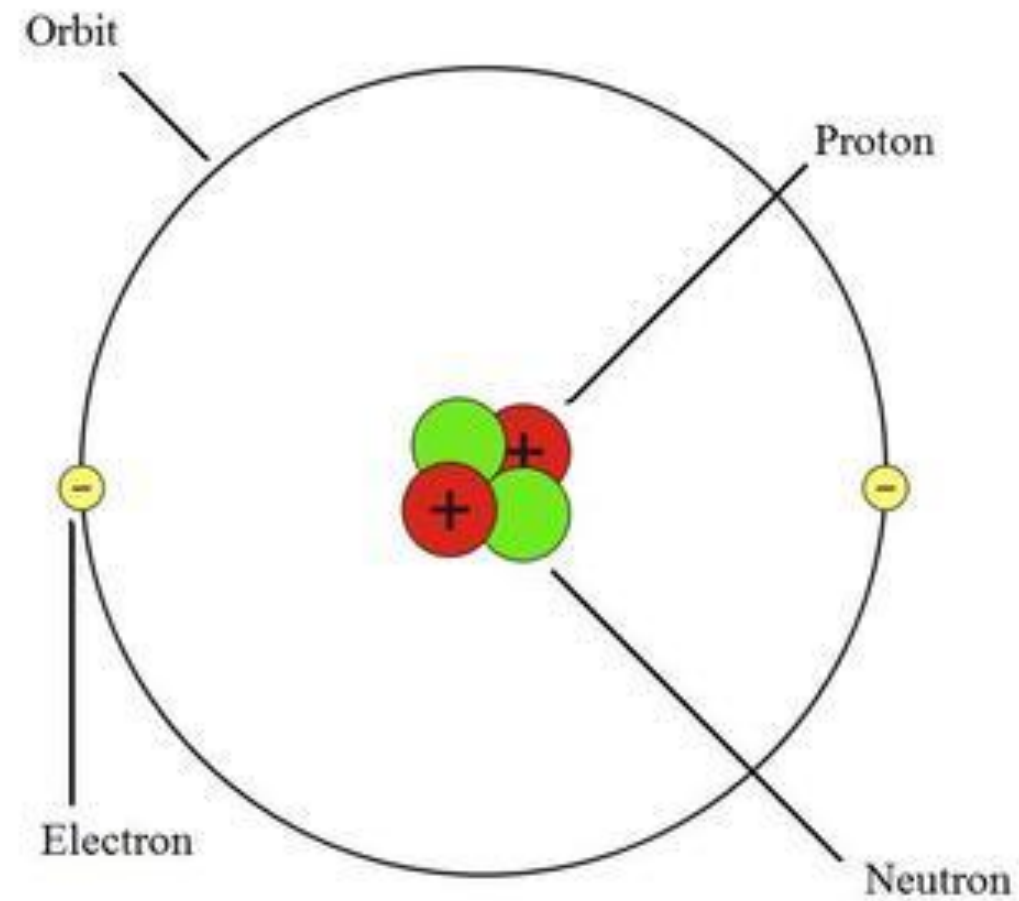


TITLE:

MiniBOONE Experiment Classification Analysis



Standard Model of Elementary Particles

	three generations of matter (fermions)			interactions / force carriers (bosons)	
	I	II	III		
mass	$\approx 2.2 \text{ MeV}/c^2$	$\approx 1.28 \text{ GeV}/c^2$	$\approx 173.1 \text{ GeV}/c^2$	0	$\approx 124.97 \text{ GeV}/c^2$
charge	$\frac{2}{3}$	$\frac{2}{3}$	$\frac{2}{3}$	0	0
spin	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	0
QUARKS	u up	c charm	t top	g gluon	H higgs
	$\approx 4.7 \text{ MeV}/c^2$	$\approx 96 \text{ MeV}/c^2$	$\approx 4.18 \text{ GeV}/c^2$	0	
	$-\frac{1}{3}$	$-\frac{1}{3}$	$-\frac{1}{3}$	0	
	d down	s strange	b bottom	γ photon	
	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	
LEPTONS	$\approx 0.511 \text{ MeV}/c^2$	$\approx 105.66 \text{ MeV}/c^2$	$\approx 1.7768 \text{ GeV}/c^2$	$\approx 91.19 \text{ GeV}/c^2$	
	-1	-1	-1	0	
	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	
	e electron	μ muon	τ tau	Z Z boson	
	$< 1.0 \text{ eV}/c^2$	$< 0.17 \text{ MeV}/c^2$	$< 18.2 \text{ MeV}/c^2$	$\approx 80.39 \text{ GeV}/c^2$	
	0	0	0	± 1	
	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	1	
	ν_e electron neutrino	ν_μ muon neutrino	ν_τ tau neutrino	W W boson	

SCALAR BOSONS

GAUGE BOSONS
VECTOR BOSONS

Group Members:
Allen Wu
Benita Diop

IMBALANCE RATIO= 0.39

N= 130064 || P= 50

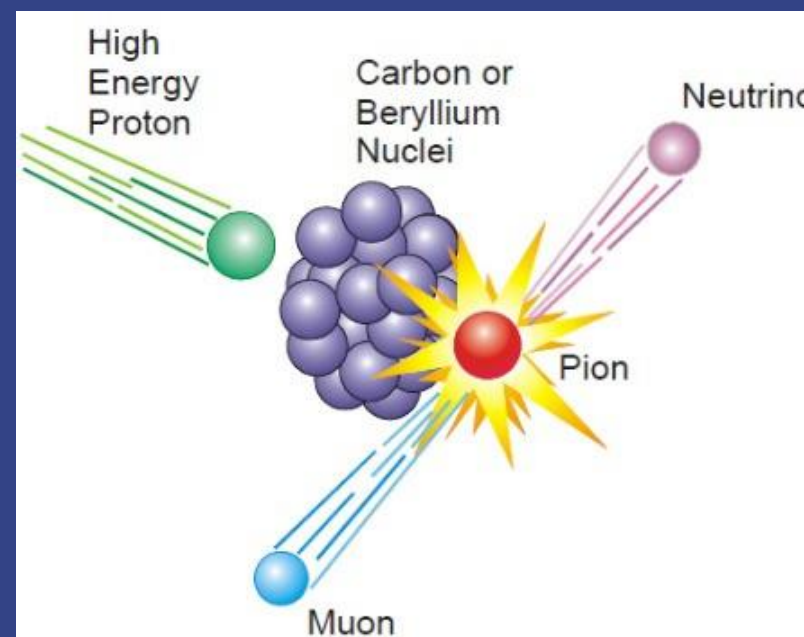
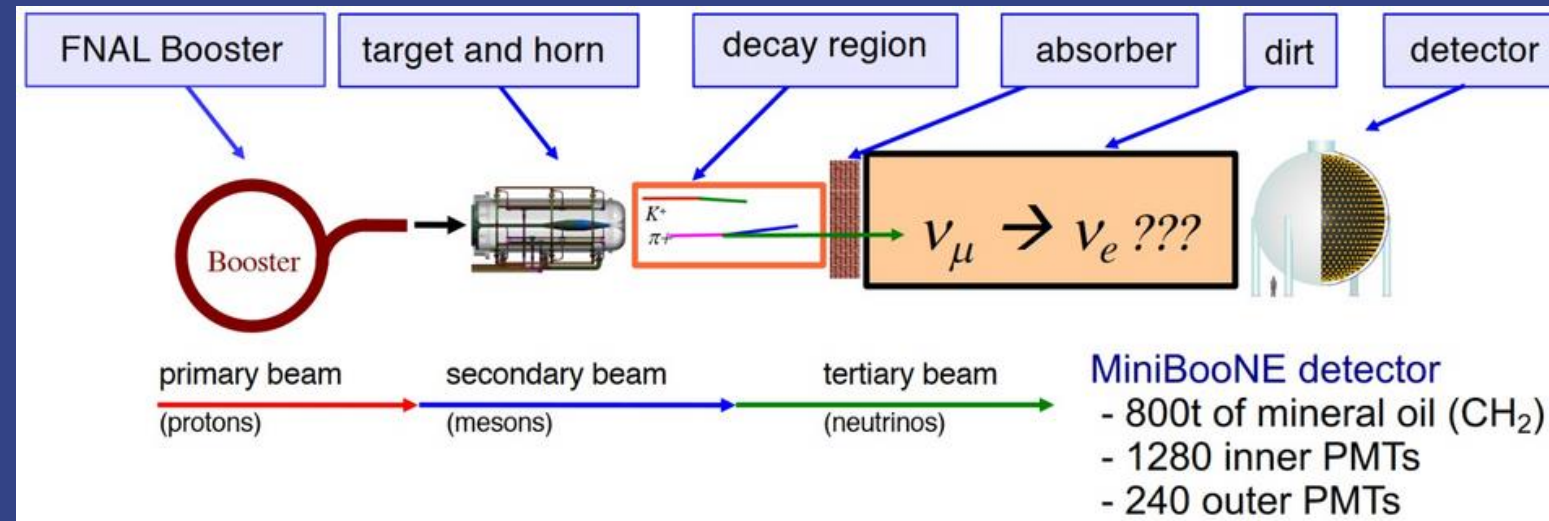
```
# Get the number of electrons and muons in the file  
num_electron, num_muon = mb.get_num_neutrinos(Path("data/MiniBooNE_PID.txt"))
```

Number of electrons: 36,499

Number of muons: 93,565

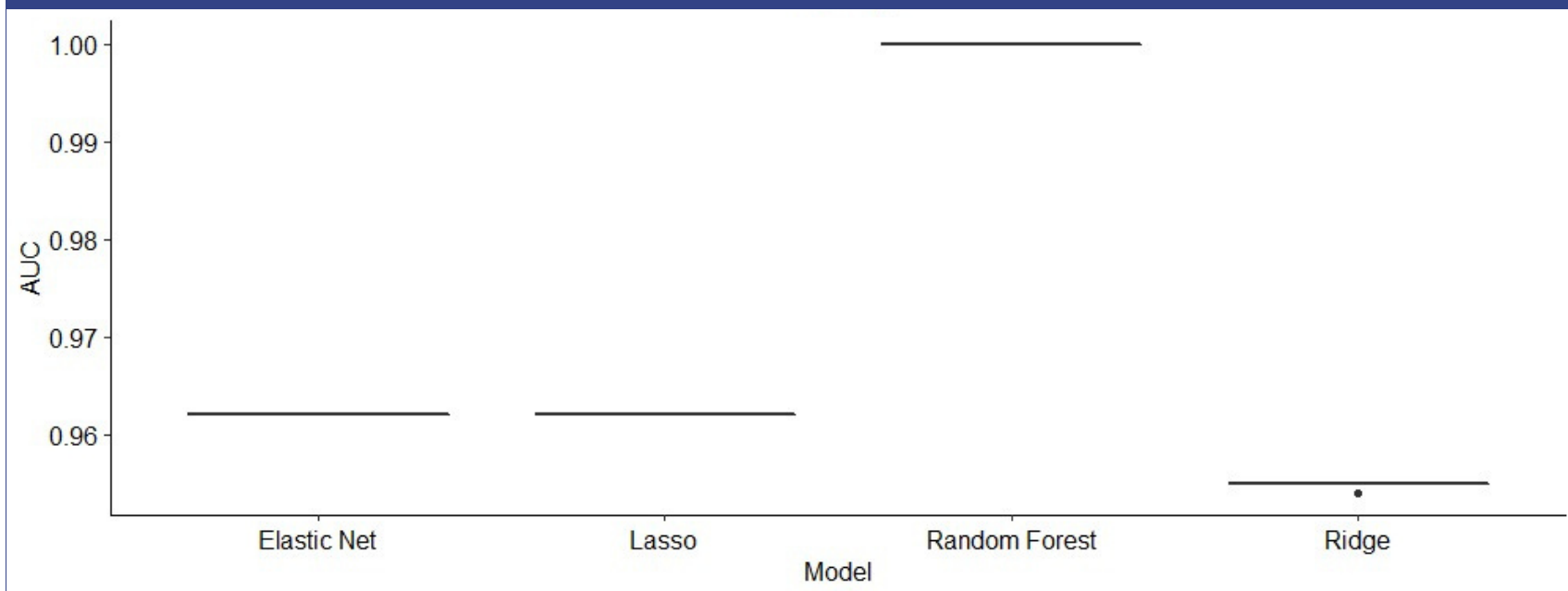
Electrons = 1

Muons = 0

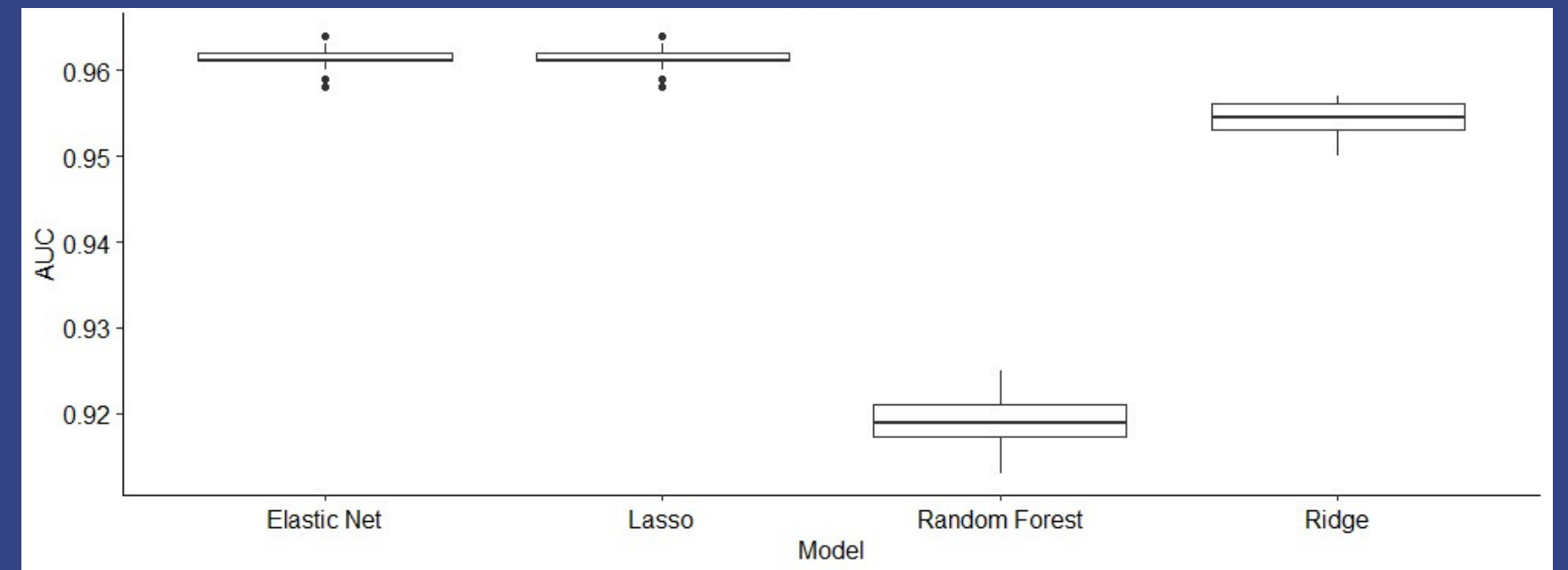


BOX PLOT AUC

TRAINING



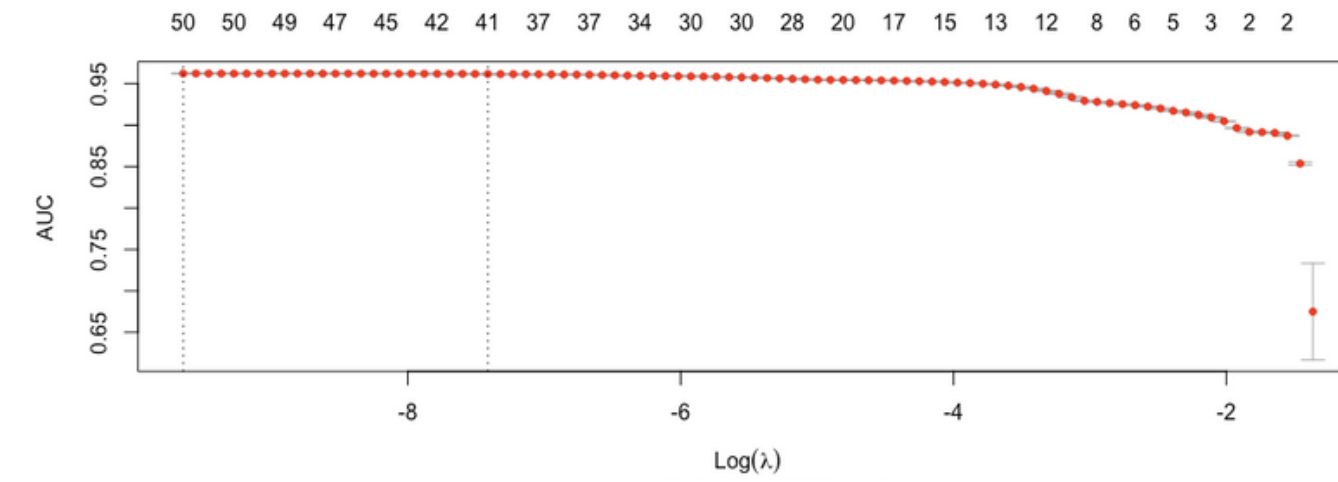
TESTING



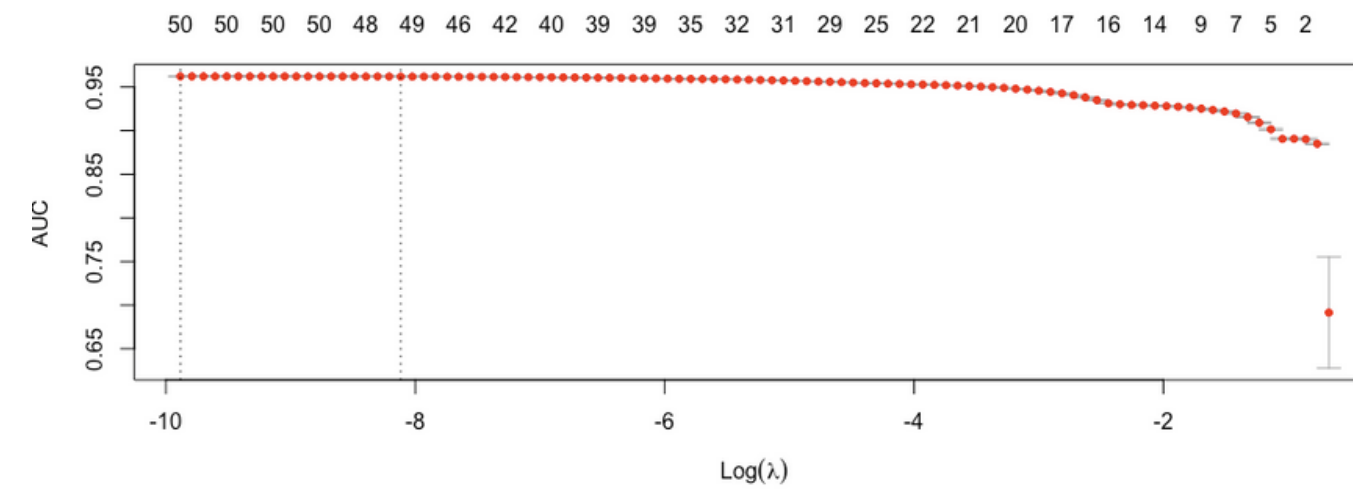
<u>MODEL</u> <u>DIAGNOSTICS</u>	<u>TIME</u> (mins)	<u>AUC</u>	<u>90% C.I.</u> <u>TEST AUC</u>
LASSO	3.0	0.96	0.958 - 0.963
RIDGE	2.3	0.95	0.951 - 0.957
ELASTIC NET	3.2	0.96	0.958 - 0.963
RANDOM FOREST	5.2	0.92	0.916 - 0.925

10 - FOLD CV CURVES

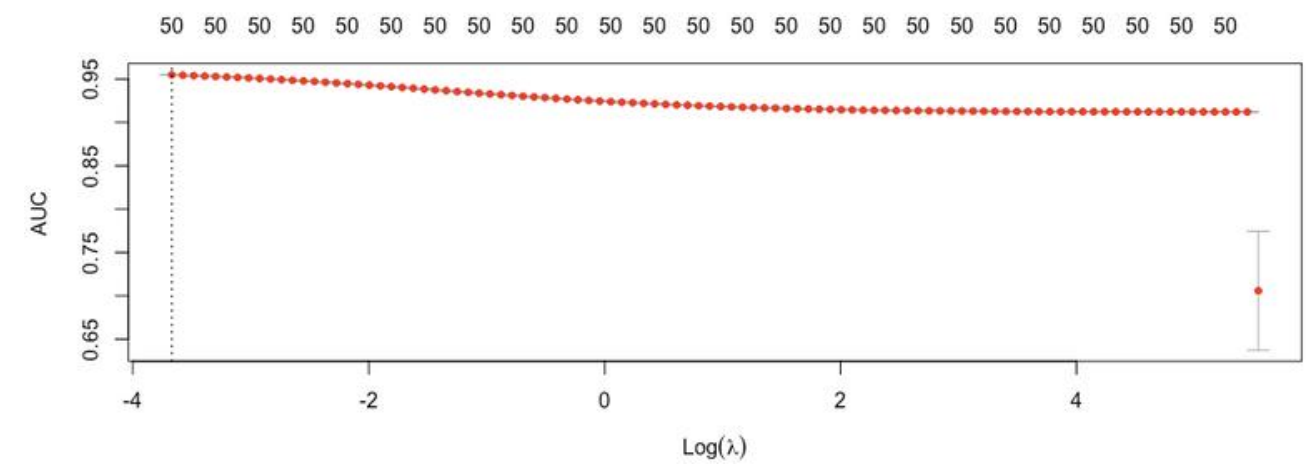
LASSO 3.0 MINS



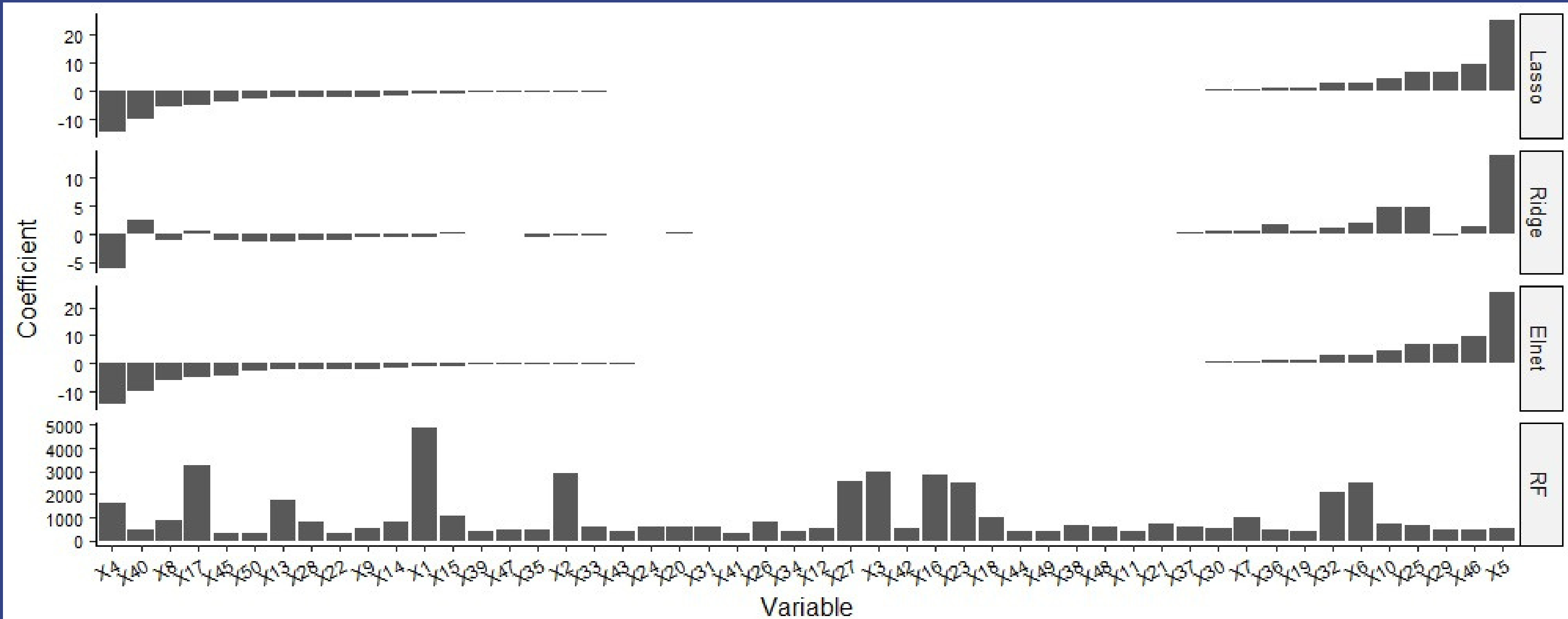
ELASTIC NET 3.2 MINS



RIDGE 2.3 MINS



BAR-PLOTS OF THE ESTIMATED COEFFICIENTS



Conclusion!

Learn More @
https://bit.ly/9891_Group_11